T H E S I S

ON

THE EFFICACY OF ACTINIC-RAY THERAPY.

BY

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--------"THE EFFICACY OF ACTINIC-RAY THERAPY".--------

History:-

On account of the wonderful results achieved by the use of the Ultra-Violet rays in the treatment of many varieties of diseases, for nearly three years; the writer has come to look upon this form of "light " treatment, as an indispensable aid to the physician's armamentarium.

We have been told by scientists, that both the animal and the vegetable kingdom have enjoyed the beneficial effects of sunlight for nearly half a million years. To recapitulate a few well known facts; sunlight consists of more than the mere visible rays, which we discern as light. Briefly the component parts are as follow;- The red rays are the longest of the so called visible rays, and beyond these are the longer, invisible, infra-red rays, which produce the heat derived from the sun. Beyond these again are the Hertzian, invisible waves, on the latter depends, what we now know as wireless telegraphy. The shortest are the violet and the blue, and next to them come the shorter invisible, chemical, or actinic rays; it is with the therapeutic value of the latter, that the writer wishes to deal in the subsequent pages. The chemical stimulation of the human organism by light, is an essential factor in maintaining life.

If a person is confined to a room, from which light

is excluded, for any length of time, that person becomes anaemic and pale lookimg. When that person is then allowed to go into light he assumes a more healthy appearance, which is due to an increase in the amount of haemoglobin in his blood. In the case of plants if all light is cut off and they are left to remain in the dark for some time, while the essential soil nutrients are freely supplied, the plant continues to grow, but it would be devoid of its natural green colour and the leaves would be white or yellowish, because chlorophyl is only developed in the presence of light.

Description of Apparatus and Technique:-

Natural sunlight, however, cannot conveniently be utilised in the treatment of disease , because during the winter months the sun seldom shines, but apart from that, there are other draw backs. The intensity of the sun's rays varies considerably, and the ultra-violet rays are mostly absorbed by the moisture and the dust in the air at the surface of the earth. Therefore one has to have recourse to artificially produced actinic rays.

The writer uses a lamp consisting of a vacuum tube of fused Quartz, containing mercury vapour, which is electrically heated to a very high temperature. It emits ultra-violet arys in large quantities.

But even with such a source of light at ones disposal

there are unsurmountable difficulties.
With reference to technique, the makers of the lamp supply a rough guide with each apparatus. For those who are inexperienced, it is advisable to follow these directions very carefully: until one has become more familiar with the actions and effects of the rays. The skin must be bare and absolutely free from extraneous matter, eg:- crusts and even an excessive amount of grease. The thinnest piece of muslin interposed between the part to be exposed to the light and the source of light, would absorb quite an appreciable amount of the actinic rays. The operator and the patient are not free from danger; the eyes of both must always be carefully protected by wearing glasses made for the purpose. The dosage of light varies within wide limits. No two patients are alike. The first exposure in a case of general body treatment, should not last longer than sixty seconds with the source of light not more than thirty inches from the body surface; and in the case of local treatment, the duration may be five minutes with the applicator in contact. This would enable one to gauge the tolerance and susceptibility of the patient. Children require a correspondingly smaller dosage. Blonds respond more readily than brunetts, and the normal skin is more easily influenced than when it is diseased. Precise notes should be kept for reference in subsequent sittings. The actual application of the

actinic rays is simplicity itself.

It might be added that the initial expense and the running costs; in the way of current consumption and upkeep, are by no means low. However, as a valuable adjunct to Materia Medica, the expense entailed, becomes of secondary importance.

Therapeutic Indications:-

Being in general practice the conditions, in which, actinic ray therapy has been employed must of necessity cover a large field. There were failures where one expected certain cures. This may be accounted for by the fact, that often the patient for some reason or another was unable or reluctant to continue with the treatment; on the other hand stress of work frequently prevented one from giving the necessary attention to a refractory case. On the whole, however, the results were almost uniformly gratifying. So much so ,that the writer wishes, in a humble way, to draw attention to the vast possibilities in this little explored form of alleviating suffering. It is impossible here, to enumerate all the diseases, in which, actinic therapy is indicated. It would be ridiculous to say that a patient, who is suffering from a cerebral tumour, or an advanced malignant growth, would derive benefit from such treatment; but in more amenable, and not necessarily easily accessible or superficial lesions, the writer has been agreeably surprised at

the marked improvement or cure as the case may be. which almost invariably followed upon the therapeutic application of the actinic rays. The ultra-violet ray often proves a blessing in disguise, where the patience, of both the medical practitioner and the patient, has been sorely tried by the use of more generally recognised procedures.

It will suffice to indicate a few of the many diseases in the treatment of which, one would recommend actino-therapy, viz;- Acne, Alopecia Areata, Eczema, Impetigo, Burns, Psoriasis, Chilblains, and almost any form of inflammation the skin is heir to. Wounds, Ulcers, and Fistulae. Also in arterial tension, in certain types of pulmonary affections, Gastro-itestinal disorders, Gout, Rheumatism, Neuritis and various forms of tuberculous infections, Arthritis, Constitutional disturbances, Gynaecological coditions etc. For a more comprehensive list the writer gives references below.

Comments on Cases:-

To obviate the monotony involved, in citing, a great number of cases, it is proposed to review the end-results obtained in the cases treated; and to give theoretical and scientific discussions, according to the writer's own observations and findings in the

course of actual treatment, with a detailed account of some of the most interestng cases under review. The latter have been chosen from a total number of over two hundred and fifty. A good many surgical conditions have been included in the case-histories. One has been reluctantly compelled to do this, in order to illustrate all the actions of the actinic rays. An endeavour has also been made, in the selection of particular cases, to quote only those, one has had an opportunity of reexamining, some considerable time after discharge. On completion of the treatment, the patients were instructed to report at varying intervals. Seventy five percent of these cases came under observation again, at least twelve months after the last actinic ray application. For this reason the records are given of cases treated, mostly during the period from September, (1920) to October(1921).

From the clinical or pathological standpoint, the cases set out below, may not be of much significance; but to the general practitioner they are of the utmost importance. For very often the reputation of the lattter, depends not so much on his ability, to diagnose some obscure nerve lesion, as it does on the cure of a trivial condition, which is probably only parenthetically referred to in some of the larger text books on medicine.

The writer is aware, that on reading the records of the cases, one is given the impression, that an

enthusiastic view has been taken, and that all the results are proter hoc, when on the other hand, it might be said, that they were simply post hoc; that of course, is inevitable. In suitable cases, if the actinic rays are judiciously used, there ought never to be a single failure.

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Illustrative Cases.

Case No.1. Abscess.

November 20th. 1920. Mr. G.H. aet. 24. Weaver.
He noticed a swelling the previous day, on the outer side of the right leg. Temperature 100 F. The swelling is red and painful. No fluctuation can be elicited. It is extremely painful and tender.
Given local radiation. The next day there was no pain, but distinct fluctuation, without tenderness and no temperature. Intentionally the abscess was not incised, but another dose of light was given.
November 22nd. 1920. the abscess burst and was discharging profusely. Streptococci were the chief organisms present. Three days later the pus was less, watery and sterile.
In eight days the wound was copletely healed.

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Case No.2.. Acne Vulgaris..

Jany.. 13th.1921. Miss G.B. aet.21. Single. Dressmaker. Her face has been full of pustules and comedones for some considerable time.. Has twice been in a large skin Hospital.. The face was cleaned from pustules and comedones,as well as possible..The eyes were protected by pledgets of cotton wool,. tied in position,. and local radiations,. with the lamp at 20" distance for one minute,. was given to the front and sides of the face.. A very severe reaction followed.. A week later the face had desquamated and there was a great improvement.. Treatment repeated with a three minutes exposure.. Reaction not so marked.. but still improving. In all the face was exposed to the light four times, and on the 29th.. the acne had practically disappeared. there was pigmentation,. but the skin was healthy.

Nov. 13th. 1921.. There was no sign of any acne or pigmentation. and the skin is smooth and soft.

This case had defied all other forms of treatment.

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Case No.3. Arthritis.

Sept.18th.1920. W.B.aet.52.Farmer..

Four years ago the left knee and hip became stiff. The pain is so severe that he will not allow the joints to be touched.. There is an apparent shortening of the affected limb of ½". with marked muscular atrophy. and extensive changes in the joints, which

Case 3.continued.
appeared to be almost ankylosed.

General and local actinic ray radiations. 1 & 5 mins. respectively. The former was given once a week and the latter daily, or as often as the skin would permit. This treatment was continued till May 15th. 1921. He was then able to walk well without the aid of any support.. There was no pain at all at the end of three weeks after starting the treatment..

21/1/23. The joints are normal in every respect, they move freely, and there is no evidence of an inflammatory condition. He can now do a hard days work without impediment or discomfort..

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Case No.4.. Bronchitis..

May 13th. 1921. Miss D.G. aet.$6\frac{1}{2}$.

She developed bronchitis when she was two years old, and has been under treatment ever since. She has just returned from abroad, where she had gone for special treatment. She is well nourished, no sign of wasting, or deformity.. The chest does not move well.There is no dulness and the V.F. is natural. Slight hyperesonance, with numerous râles all over chest. No sign of cavitation. Severe paroxysms of coughing, with non-offensive, copious, purulent or pus like expectoration.. Last year she had an autogenous vaccine course of treatment, with doubtful results..

On the above date she received general and local actinic ray radiations. The frequency of repetition

was guided by the reactions, and the dosage was gradually increased. A fortnight after commencing treatment, the chest condition had improved appreciably. She coughed less, the sputum being diminished, and more fluid.

The last exposure was given on the 16th. July. Sept. 1922. There is no cough. The lungs are practically normal but for a few rhonchi.

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Case No. 5. Chilblains.

Feb.7th.1921.Miss M.W. aet.27. Typist.

Has been troubled with swelling, redness, pain and itching of the of hands, fingers and feet, both during summer and winter; for ten or twelve years. The dorsal aspects of hands, fingers and toes were swollen, red and felt cold to the touch. The heart, lungs and abdominal viscera were normal.

General and local radiations were given, of two and five minutes respectively. The next day there was evidence of a satisfactory reaction. She experienced tingling but there was no pain. The parts were more swollen, but did not feel quite so cold to the touch. The local treatment was repeated daily, and the general radiations on alternate days; with slightly longer exposures in each case.

Feb.16th. All parts are quite normal. She has had to get a smaller size shoe, as the old ones were too big.

There is now no pain or swelling, the local asphyxia has entirely disappeared, and the skin is darkly pigmented.

November 1922. There is no sign of chilblains and there has been no recurrence. Her hands and feet have not felt cold since Feb. 1921.

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Case No. 6. Chlorosis.

March 10th. 1922. Mrs.M.M.aet.30. Housewife.

She complained of breathlessness on exertion. headache and inability to do her work. She also noticed that she was becoming anaemic about six months ago. There is pallor of the skin generally, also of the mucous membranes and the finger nails. She is constipated. The lungs are normal. The heart:-Haemic aortic murmur, systolic in time, with a marked "bruit de diable" in the neck. The pulse is 100. Temp. 98. There are no abnormal constituents in the urine. A little tenderness, on deep palpation in the epigastrium.

Blood examination;-R.B.C.. 3,300,000. W.B.C. 6,200. C.I. 0.43. The R.B.C. are pale and show irregularities (Poikilocytosis.). The treatment was commenced the following day, with a one minute entire body exposure the lamp being at 30" from the skin surface. The radiations were repeated daily, except sundays and on occasions when the reactions were severe. Eventually the lamp was approximated to within 18" from the skin surface, and the maximum duration of exposure never

exceeded 8 minutes. Iron was not given. The improvement was decided from the out set. On July 9th. she felt so much better that she made a request to be excused attendance. A final blood examination turned out as follow:- R.B.C. 4,300,000. and the W.B.C.. 6000. The C.I. being 0.98. or nearly one.

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Case No.7. Chronic Eczema. 5/5/20.Mr.J.D.aet.25.Weaver. While in France he contracted eczema, and it was thought that he had got the infection from mules he was looking after. He was admitted to several hospitals in France. During the last eighteen months he has been attending a skin hospital in Manchester. There is a rash involving the whole of the upper limbs and the face. The affected parts are very much inflamed, with pustular scabs. and a nasty discharge. One eye is completely closed, and the face presents a hideous sight. After protecting the eyes, the affected parts were exposed to the actinic rays for two minutes. The The radiations were repeated nearly daily, up to the 28th.May. when he was completely cured. On the third day all discharge had and scabs had disappeared, and he could open the eye quite well. No other treatment was given, except dressings and a bland lotion. Recently one had an opportunity of examining his face. There is no vestige of eczema, and has not had any skin trouble since the last light application.

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Case No.8. Chronic Osteomyelitis.

March 17th.1921. Miss A.A.J.aet.47.

Twelve years ago, pains and aches devloped in all her limbs, and slowly but surely her symptoms have progressed. Constant excruciating pain never abated. She is under the impression that she never sleeps. A helpless, pathetic, cripple. The bones are softening and bending. The long bones are very tender and swollen. The appetite is poor. There is a mitral presystolic bruit. In the chest a few bronchitic râles can be heard. Slight cough. Up to now she has been taking weekly ℥vi. of Liq:Morphinæ.

Three minutes exposure back and front of entire body, and repeated on altermate days, prolonging or shortening time of exposure according to the reactions.

March 21st. Sleeps much better, experiences no pain except on attempting to move. Morphine stopped altogether.

May 4th. Had seven hours continuous sleep. There is no pain, and movements of joints much improved. She is sitting up. Takes a keen interest in her surroundings, and is able to sew.

Sept.14th.Went to church on Sunday for the first time in nine years. She can walk quite well.

Dec.1922.She commenced business as a tobacconist about seven months ago. She was advised not to do so owing the standing involved in such a business, but apparently she is still keeping well. Total No. of eighty radiations.

Case No. 9. Gastric Ulcer.

May 26th. 1921. Mr.A.W. aet.48.Shop Manager.

Has had pain and vomiting for years. The pain comes on immediately on taking food, which is promptly vomited. The appetite is good. For the last fifteen months he has been vomiting a lot of blood. There is tenderness and rigidity a little to the left of the epigastrium. The tongue is clean. Free HCL. is in excess.X-ray examination confirmed the diagnosis. Treatment was commenced on the above date. Three exposures being given weekly. He vomiting much more the following day, but the haemorrhage was less, and did not feel quite so uncomfortable. No drugs exhibited, but careful dieting.

June 11th. there is no pain or tenderness, vomiting and haemorrhage have ceased. He is feeling and looking much better.

Received the last radiation September 1st. 1921.

July 1922. He can eat almost any kind of food, and never has any discomfort. He has been seen many times since the last actinic ray application. To my mind a radical cure was effected.

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Case No. 10. High-Blood Pressure.

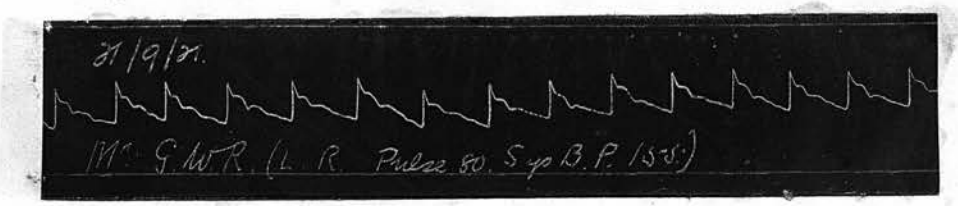
Sept.14th.1921. Mr.G.W.R.aet.47. Manager.

Complains of depression along with intractable, severe headache, and frequent attacks of giddiness. He has to rest half way up the stairs on account of breathlessness. He sleeps badly and the appetite is poor.

Heart slightly displaced to the left. sounds closed. Accentuated 2nd. aortic sound. Lungs and urine normal. No temperature. Pulse 80. Arterial wall can be distinctly felt, and it requires considerable pressure to obliterate the pulse.

The above tracing was taken at 3pm. before the treatment. The systolic pressure was 179 mm. and the diastolic pressure 90 mm. The systolic pressure in the leg of the same side was 219 mm.

General body radiations given daily, except sundays, for a month. 15 hours after the exposure the systolic blood-pressure was 159 mm.



The second tracing was taken a week later at 3pm.

Case 10 continued.

The systolic pressure in the leg was also 159mm. The two legs and arms being the same.

At the end of the month, two exposures were given per week for four weeks, and during the following month, the exposures were reduced to once weekly. Finally to one exposure per month for six months, when the treatment was discontinued.

June 1922. He feels fit, and can do his work with pleasure.

The systolic blood-pressure is now 150 mm.

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Case No. 11. Impetigo Contagiosa.

June 2nd. 1921. R.A.W.aet 21. Gardener.

The whole of the face and both the upper limbs, are one mass of purulent crusts. During the last fortnight he has been getting the following treatment, which usually cures this condition in a few days, viz;-

Properly made starch poultices, containing boracic acid and applied by an experienced nurse. When all the crusts had been carefully removed, the following ointment was applied to the raw surfaces. R. Ung:Hydrarg: Ammon:Dil:(B.P.), 1%. A much bigger area is now involved than when he was first seen, and constitutional symptoms are present.

He was given a three minutes exposure, and on the next day the remaining scabs were easily removed. There was

Case No. 11 continued.

hardly any moisture. Treatment repeated.

June 6th. Practically cured. No further treatment was given. He resumed work on the 8th.June.

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Case No.12. Neuritis.

Feb.18th.1921. Miss M.H.aet.30. Domestic Servant. Complains of much pain, and numbness of the left arm, which hangs quite limp by her side. Sleeps badly.This patient has been under treatment for over twelve month -s, without the slightest improvement. One naturally then thought that she might be benefitted by actinic ray treatment. The front and the back of the arm were exposed for three minutes on each side. The pain subsided after the first appplication. A week later she could use the arm freely, there was then no pain or numbness. In all she received 15 radiations.

31/1/23. There has been no recurrence up to date.

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Case No.13. Perforating Trophic Ulcer.

Nov.15th.1920. Mr.J.K.aet25. Discharged Soldier.

While on active sevice, the left femur was fractured with injury to the sciatic nerve. There is a deep ulcer on the ball of the left big toe.with two sinuses running up to the skin on either side ~~the~~ of the bone. The smallest Quartz rod was passed up each sinus in turn, and radiated for three minutes. Sharp haemorrhage

Case No. 13. continued.

followed upon withdrawal of the rod.

Nov.27th. Has had five applications, each of five minutes duration. The sinuses are not so deep. Haemorrhage has stopped. The discharge, which was at first profuse, is diminishing.

Dec.23rd. The sinuses are completely filled in. The ulcer looks healthier, after eleven additional radiations. The treatment was continued, with three applications weekly, up to June 6th.1921., when the ulcer was found to be firmly healed. Apart from dressings, no other form of treatment was resorted to, and the patient was not confined to bed for a single day. Once a month a general body radiation was given, the course of the sciatic nerve receiving special attention. Six months later, the scar was healthy and strong. The nerve appeared to have regained its full function.

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Case No.14. Rodent Ulcer.

August 18th.1921. Mr.H.T.aet.58.

The ulcer developed at the side of the nose ten years ago. Was operated upon twice, with prolonged treatment at a skin hospital in a university town.

There is a large ulcer involving nearly the whole side of the nose, and extending inwards and downwards for $\frac{1}{2}$", the surface is practically covered with a hard crust.

Case No. 14. continued.

Five minutes exposure to ulcer and cheek.

Aug.20th. 10 mins. exposure. Profuse discharge. scab removed.

Aug.21st.	15	"	"	"	"
" 25th.	25	"	"	Less	"
" 29 "	30	"	"	Healthy granulations.	
Sept.2nd.	30	"	"	A little serous discharge	
" 16th.	35	"	"	Small raw surface.	

Oct. 4th. Wound completely healed. Scar is healthy.

Total number of radiations 14.

Aug. 11th. 1922. Scar only noticeable on close inspection.

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Case No. 15. Seborrhoea.

Oct.12th.1921 Mr.J.M.aet.46.

Has had dandruff, as long as he can remember. It is a case of severe seborrhoea, with a mixed infection. The inflammation extends to the forehead and the backs of the ears. There is hyperaemia.vesicles and a great deal of discharge. Considerable irritation.

Two minutes exposure, over each of thirty areas, to cover the whole of the affected parts. Scalp washed daily with soap and water.

Oct.14th. & 15th. exposures repeated as above. The whole area under treatment is more hyperaemic, and is peeling freely.

Case No.15. continued.

Oct.25th. Skin is now quite healthy. There is no sign of any scales or sepsis.

Total number of radiations 11.

Aug.5th.1922.The scalp is quite free from seborrhoea. This is the only specific remedy for this troublesome condition.

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Case No. 16. Simple Goitre.

May 31st.1921. Miss F.G.H.aet. 29.

She first noticed a swelling of the neck about five years ago. It has given her no trouble whatever. At times she is a little breathless and nervous. Size of neck over most prominent part of the ~~swelling~~ swelling is 13½". The tumour is of uniform consistence, and moves with deglutition. It is not adherent to the underlying structures, and is fairly soft. It is situated across the front of the neck. Pulse 97.Resp.24. Fine tremors of the fingers and tongue. No exophthalmos. Diagnosis:- Parenchymatous Goitre. Other organs are normal.

Actinic ray applications were commenced at once, and repeated daily, but the reactions were not at all well marked. The dosage had to be considerably increased, before the usual reactions could be produced. It was found that a sixty minute exposure thrice weekly had the desired effect.

The condition steadily improved, and at the end of the

Case No. 16.continued.

course of treatment (26/11/21). the goitre had almost disappeared. The neck measured 11". The pulse was 80. There were no tremors, and the reflexes were normal. July 1922. The neck is normal, and nothing can be felt.

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Case No. 17.Varicose Ulcer.

Oct.5th.1920. H.H. Army Pensioner.

In France, four years ago, ulcers developed on both legs. He appears to have had phlebitis followed by thrombosis of the posterior veins of both legs. On each leg there are four ulcers. The largest measures 2" across, and the smallest 1¼". Much necrosed tissue at the bases, with a purulent, offensive discharge. The ulcers extend deep down into the tissues of the legs. Needless to say he has been in many hospitals abroad and at home.

Local actinic ray exposures thrice weekly. General radiations were not considered necessary.

December 17th. All the ulcers firmly healed. Ssar strong and healthy.

He has been seen almost daily since, and has not had the slightest trouble.

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CONCLUSIONS.

I..

The actinic rays penetrate the skin readily. The depth of penetration depending upon:(a) the skin's resistance,(b) the intensity of the rays; and (c) also upon the distance and period of exposure.

When properly applied there is no irritation, and permanent ill-effects never came under ones notice.

Classified according to the reactions, there are three distinct degrees:-

1. Active hyperaemia, with pigmentation, and followed by slight desquamation, with or without remote effects.
2. Hyperaemia with induration, accompanied by the usual sequelae of increased blood supply, viz;- heat, redness, swelling and pain.
3. Marked constitutional disturbance, which manifests itself in the symptom complex of anaphylactic shock.

Physiologically then, we find that, the lymph channels become engorged; the peripheral blood vessels dilate. a soothing effect is produced in the nervous system, with an alteration of the "tone" of the blood vessels. On these factors depends the relief of pain and the reduction of the blood-pressure.

Action on the blood:- The amount of haemoglobin and the number of red cells increase. The leucocytes diminish in number and the lymphocytes often multiply. Protoplasm absorbs ultra-violet light.The oxygen carrying powers of the blood are improved. Oxidation is

Conclusions continued.

increased. The percentage proportion of urea-nitrogen, after continued exposure, tends to increase considerably, and metabolism is stimulated.

The ultra-violet rays are decidedly bactericidal, antiseptic and powerfully analgesic. The resistance power of the body, is raised against bacterial invasion.

The general tone is braced up, and there is a feeling of well being. The effects of the rays are conducive to sleep. The appetite improves under their action and the weight tends to increase.

Joints with impaired mobility regain their normal functions.

A course of treatment often produces a psychical effect: this is probably attributable to the brightness of the light, and the general environment where such measures are employed.

II.

From the therapeutic point of view, the actinic rays compare favourably with the X-rays, which are much more complicated phenomena. The installation of a much more expensive and intricate apparatus, is necessary, for the generation of the X-rays. The dangers, to operator and patient, however well, protected, are greater. In the case of actinotherapy the requisite experience for success is acquired in a week or two, whereas in the case of X-rays, the same

Conclusions continued.

experience cannot be gained in twice the number of years. In many skin conditions the X-rays are far superior, but there are many attendent dangers, expert knowledge is essetial, with the result, that X-ray treatment is usually relegated to the skilled radiotherapist.

III.

It is not implied that actinotherapy should be applied to the exclusion of all other remedial measures. Drugs, electricity, massage etc, should receive due consideration.

Used empirically in many obscure conditions, which incapacitated the individual in one way or another, from following his or her vocation; the chemical ray, as a therapeutic agent, in the writer's estimation, has established itself as a powerful weapon in combatting disease.

Perseverance and patience are frequently necssary to achieve success.

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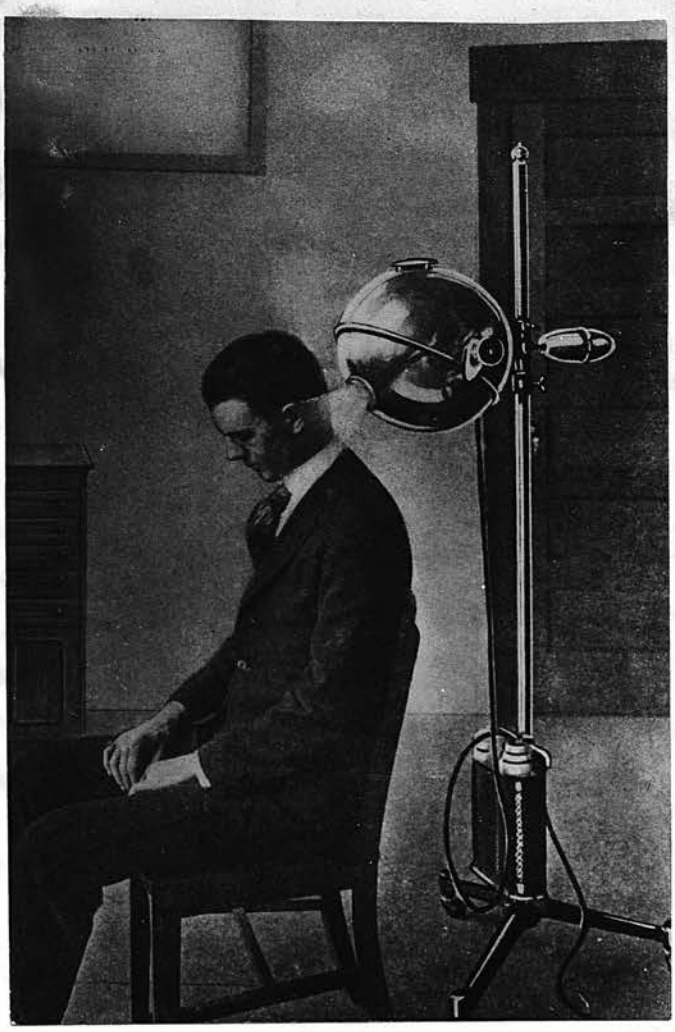
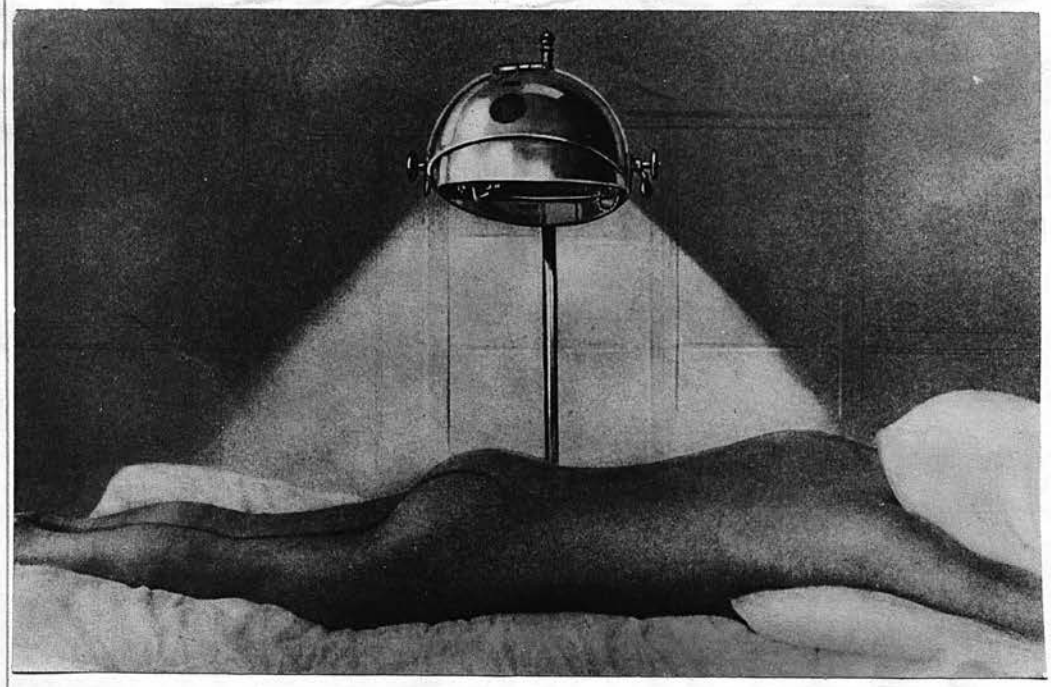


Local radiation through Diaphragm..



General body radiation.